RESEARCH PAPER NO. 51

Stability and change in risky driving from the late teens to the late twenties

Suzanne Vassallo, Julie Lahausse and Ben Edwards

Report prepared by the Australian Institute of Family Studies for the
Transport Accident Commission of Victoria and the Royal Automobile Club of Victoria

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No. 51 *Stability and change in risky driving from the late teens to the late twenties: Report prepared by the Australian Institute of Family Studies for the Transport Accident Commission of Victoria and the Royal Automobile Club of Victoria*. Suzanne Vassallo, Julie Lahausse and Ben Edwards, March 2013.

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Contents

List of tables

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Executive summary

Little is known about the factors associated with different across-time patterns of risky driving behaviour. This paper—the product of a collaborative partnership between the Australian Institute of Family Studies, the Transport Accident Commission of Victoria and the Royal Automobile Club of Victoria—uses data from the Australian Temperament Project to: (a) examine patterns of risky driving from the late teens to the late twenties; and (b) to identify factors associated with persistence and change in risky driving tendencies. This executive summary highlights the key findings emerging from this research.

The Australian Temperament Project

The Australian Temperament Project is a longitudinal community study that has followed the development and wellbeing of a large group of Victorians over the first 28 years of life. Starting in 1983, fifteen waves of data have been collected from parents, teachers and the young people, on various aspects of the young people's lives.

During the three most recent surveys (at ages 19–20, 23–24 and 27–28 years), information on young people's driving histories and practices has been collected, with a large focus on their engagement in risky driving behaviours (i.e., speeding, driving while fatigued, driving while affected by alcohol, and driving without a seatbelt/helmet).

Stability of risky driving

Groups were formed according to participants' responses to the risky driving questions at 19–20 and 27–28 years. At each time point, each participant's level of risky driving behaviour was classified as high, moderate or low. Respondents were then allocated to groups on the basis of the stability of their risky driving classification (low, moderate or high) from 19–20 to 27–28 years (see Table ES1).

Table ES1: Summary of risky driving groups

Group	Level of risky driving		*N*
	19–20 years	27–28 years	
Stable			
Stable high	High	High	63
Stable moderate	Moderate	Moderate	105
Stable low	Low	Low	68
Decreasing			
High to low/moderate	High	Low/moderate	95
Moderate to low	Moderate	Low	126
Increasing			
Low to high/moderate	Low	High/moderate	48
Moderate to high	Moderate	High	61

Note: 169 participants displayed patterns that did not fit these groups and were excluded from further analyses.

Comparison of risky driving groups

Groups were compared on a range of characteristics at 19–20 and 27–28 years to determine whether they exhibited distinct profiles. A number of significant differences were found. A summary of these follows.

Stable groups

- Males, frequent binge drinkers (at 27–28 years), and antisocial individuals (at 19–20 and 27–28 years) were more likely to be in the *stable high* group.
- The *stable low* group were more likely to be female and report lower levels of antisocial behaviour (at 19–20 and 27–28 years).
- The *stable moderate* group was less likely to contain young people who were parents or who engaged in frequent binge drinking (at 27–28 years).

Decreasing groups

- High antisocial behaviour was predictive of being in the *high to low/moderate* group at 19–20 years. This difference was no longer evident at 27–28 years.
- The *moderate to low* group were characterised by lower levels of antisocial behaviour at 27–28 years.

Increasing groups

- Highly antisocial individuals were less likely to be in the *low to high/moderate* group at 19–20 years. However, this group was distinguished by low social skills at 27–28 years.
- The *moderate to high* group did not significantly differ from other groups on any of the predictor variables.

Conclusion

Antisocial behaviour appeared to be strongly linked to persistence and change in risky driving, adding support to the view that risky driving may form part of a broader underlying tendency to engage in problem behaviour(s). In contrast, low social skills were associated with an increasing propensity for risky driving among some young drivers. Binge drinking, gender and parental status also differentiated between drivers who exhibited different across-time patterns of risky driving behaviour. These findings add to a growing body of research that suggests that risky drivers are not identical. Hence, when considering how best to target this behaviour, it would appear important to distinguish between subgroups of drivers, as the factors that underlie their behaviour may differ.

Stability and change in risky driving from the late teens to the late twenties

Introduction

While there has been a significant reduction in the Australian road toll in recent decades (Australian Transport Safety Bureau, 2007), young drivers continue to be over-represented among those injured or killed in traffic accidents (Transport Accident Commission [TAC], 2012). Risky driving behaviours—such as speeding (Palamara & Stevenson, 2003), driving while fatigued (Dobbie, 2002) and driving while under the influence of alcohol (Engström, Gregersen, Hernetkoski, Keskinen, & Nyberg, 2003)—are often implicated in these crashes.

A large body of research has sought to clarify the factors that contribute to the high incidence of risky driving among young drivers. However, less is known about how a young person's engagement in risky driving changes as he or she ages and gains experience on the road, and the factors associated with stability and change in this behaviour.

This report—a product of the collaborative partnership between the Australian Institute of Family Studies (AIFS), the Transport Accident Commission of Victoria and the Royal Automobile Club of Victoria (RACV)—aims to investigate the stability of risky driving from the late teens to the late twenties, and examine the individual, family and broader environmental factors associated with different across-time patterns of risky driving (i.e., stable, increasing and decreasing).

Stability of risky driving behaviour

The limited longitudinal research available suggests that engagement in risky driving generally decreases as young people make the transition from adolescence to adulthood (Bingham, Shope, Zakrajsek, & Raghunathan, 2008; Jessor, Turbin, & Costa, 1997). Explanations for this trend point to the positive effects that greater driving experience may have on young adults' driving abilities (Bingham et al., 2008; Cavallo & Triggs, 1996), as well as the cognitive and emotional growth that typically occurs over this period, as the areas of the brain concerned with impulse control, decision-making and judgement mature (Giedd, 2004; Sowell, Thompson, Holmes, Jernigan, & Toga, 1999) and young people adopt adult occupational, relationship and parental roles (Bingham et al., 2008; Jessor et al., 1997).

However, while the majority appear to "grow out" of their risky driving tendencies, for a small number this behaviour appears more entrenched, persisting beyond the early driving years (Begg & Langley, 2004; Gulliver & Begg, 2007). Little is known about the characteristics of these "persistent risky drivers", although a series of studies conducted in New Zealand suggest that they are more likely to be male, more aggressive and lower in constraint than other drivers (Begg & Langley, 2004; Gulliver & Begg, 2007).

The current study

Few studies have examined the factors associated with different across-time patterns of risky driving. The current report aims to address this gap by examining patterns of risky driving among

individuals from their late teens (age 19–20) to their late twenties (age 27–28), and factors associated with these different across-time patterns, using data from the Australian Temperament Project (ATP).

In previous research from the ATP, young people who were identified as showing high, moderate or low levels of risky driving at 19–20 years were subsequently followed to determine whether they would show the same risky driving patterns four years later (see Vassallo et al., 2010). Close to two-thirds (62%) displayed the same pattern of risky driving at 23–24 years as they did at 19–20 years (i.e., low, moderate or high); one in five (19%) showed an increase in risky driving over this time span; and a similar proportion (20%) showed a decrease in risky driving behaviour. The highest levels of stability were found among those with low levels of risky driving at 19–20 years. Although a decrease was evident in the risky driving propensities of many who had been classified as moderate or high risky drivers at age 19–20, 48% of the former group, and 77% of the latter group, still exhibited risky driving tendencies at 23–24 years.

The current report will extend this earlier research by: (a) examining the risky driving tendencies of study participants a further four years on (at age 27–28), thus enabling an examination of the stability of risky driving tendencies over a longer time period (8 years compared with 4 years); and (b) comparing groups with different across-time patterns (i.e., stable, increasing, decreasing) to identify factors or experiences that might promote persistence or change in risky driving tendencies, with the aim of informing road safety intervention and prevention initiatives.

The Australian Temperament Project

The findings presented in this report come from the Australian Temperament Project, a longitudinal study that has followed the development of a large group of Victorians from infancy onwards (for more details, see Prior, Sanson, Smart, & Oberklaid, 2000, or visit the ATP website <www.aifs.gov.au/atp>).[1]

The ATP commenced in 1983 with a sample of 2,443 infants (aged 4–8 months) and their parents, who were recruited through Maternal and Child Health Centres during a two-week period. Two-thirds were from urban localities (n = 1, 604) and one-third from rural localities (n = 839), selected on the advice of the Australian Bureau of Statistics to provide a representative sample of the state population. A comparison to Australian Census data confirmed that the sample was representative (Sanson, Prior, & Oberklaid, 1985). Fifteen waves of data have been collected so far (up to 2010–11, when young people were aged 27–28 years). Respondents have included parents, maternal and child health nurses, primary school teachers and, from 11 years, the young people themselves.

Two-thirds of the cohort (65%) remain members of the study after 28 years. The study contains slightly fewer families experiencing socioeconomic disadvantage or from a non-Australian ethnic background than at its commencement, and slightly more participants showing an easier temperament style in infancy.[2] However, there are no significant differences on infant behavioural problems between those retained and those no longer participating.

Data for this report are taken from the 13th, 14th and 15th data collection waves, when young people were aged 19–20 years (in 2002), 23–24 years (in 2006–07) and 27–28 years (in 2010–11) respectively. In total, 1,157 young adults participated in Wave 13 (73% of the retained sample,[3] 56% female), 1,000 in Wave 14 (66% of the retained sample, 61% female), and 1,055 in Wave 15 (67% of the retained sample, 58% female).

[1] The ATP is a collaboration between researchers at the Australian Institute of Family Studies, the University of Melbourne, the Royal Children's Hospital, the University of Melbourne and Deakin University, and is currently led and managed by the Australian Institute of Family Studies.

[2] Socio-economic status: $\chi^2(3) = 77.07$, $p < .001$; ethnic background: $\chi^2(2) = 30.18$, $p < .001$; easy/difficult temperament style: $t(2441) = -2.84$, $p < .01$.

[3] The "retained sample" are those participants who were eligible to participate in a particular survey wave. The size of the retained sample varies somewhat between waves, depending on the number of people who have withdrawn from the study at a particular point in time, as well as the success of efforts to re-contact study members whose contact details are no longer current.

Measures

Risky driving

Study members were asked about their engagement in risky driving at 19–20, 23–24 and 27–28 years. A summary of the items used to assess risky driving is presented in Table 1. All questions relate to participants' driving behaviours during their last ten driving trips. This time frame was selected as it was thought to be within most participants' recent recall (thus minimising the potential for recall bias).

Table 1: ATP measures of risky driving behaviour

Please think back over the last TEN TIMES you drove a car (or rode a motorcycle), and circle the number that shows on how many occasions you:
At 19–20, 23–24 and 27–28 years
Drove up to 10 km/h over the limit
Drove between 11 and 25 km/h over the limit
Drove more than 25 km/h over the limit
Did not wear your seat belt/helmet for part of the trip
Did not wear your seat belt/helmet for all of the trip
Drove when very tired
Drove when affected by alcohol
Drove when affected by an illegal drug (this question was replaced with 3 items at 23–24 and 27–28 years: drove when affected by marijuana/cannabis/THC, ecstasy or amphetamines [speed, uppers, fast etc.])
Additional questions at 23–24 and 27–28 years
Nearly fell asleep or fell asleep when driving
Talked on a hands-free mobile phone when driving (i.e., not holding the phone at all)
Talked on a handheld mobile phone when driving
Used a mobile phone function when driving (e.g., read or sent an SMS message)

Other measures from the longitudinal dataset

Groups were compared on a range of dimensions encompassing their demographic characteristics, individual attributes, behaviour problems, interpersonal relationships, and driving behaviours and experiences at 19–20 and 27–28 years.[4] The variables included in the analyses were selected on the basis of past research, which suggested that they were associated with high levels of risky driving behaviour (Vassallo et al., 2007) or a decrease in risky driving or other problem behaviours (Bingham et al., 2008; Jessor et al., 1997).

Due to the large number of variables under investigation, it is not possible to provide full details of the measures used in the current analyses. However, a summary of these variables is provided in Table 2 (on page 5), and further details are available from the authors upon request.

[4] Only variables assessed at 19–20 and 27–28 years were included in the analyses, as the predominant focus of the report was to track changes in risky driving propensity between these ages, and some respondents had missing data at 23–24 years.

Table 2: Summary of other measures used in the analyses

Dimension	Age	Measurement instrument	Number of items, response categories	Example item	Use in current analysis
Predictor variables					
Gender	4–8 months	ATP devised	Single item; 1 = male, 2 = female	Child's sex	male = 1, female = 0.
Education	27–28 years	ATP devised	Single item; 9 options ranging from "Yr 8, 9, 10 or equivalent" to "Postgraduate degree"	What is the highest level of education you have completed?	1 = no post-secondary education, 0 = post-secondary education
Persistence	19–20 years	Adaptation of McClowry's (1995) School-Age Temperament Inventory	3 items; 5-point scale ranging from 1 = "very untrue" to 5 = "very true"	I persist at a task until it is finished	1 = low persistence (lowest quartile), 0 = remainder
Negative reactivity	19–20 years	Adaptation of McClowry's (1995) School-Age Temperament Inventory	6 items; 5-point scale ranging from 1 = "very untrue" to 5 = "very true"	I react intensely when frustrated	1 = high reactivity (highest quartile), 0 = remainder
Social skills	19–20 & 27–28 years	ATP devised, based on Gresham & Elliott's (1990) Social Skills Rating System (see Smart & Sanson, 2003)	17 items at 19–20, 19 items at 27–28; 5-point scale ranging from 1 = "never" to 5 = "always"	I find it easy to make friends	1 = low social skills (lowest quartile), 0 = remainder
Civic-mindedness	19–20 & 27–28 years	Adaptation of Stone and Hughes (2002)	10 items at 19–20, 16 items at 27–28; 5-point scale ranging from 1 = "no" to 5 = "11+ times"	Given blood Supported a political or lobby group	1 = low civic-mindedness (lowest quartile), 0 = remainder
Antisocial behaviour	19–20 & 27–28 years	Adaptation of Elliott and Ageton's (1980) Self-Report Delinquency Scale	21 items at 19–20, 19 items at 27–28; 6-point scale ranging from 1 = "never" to 6 = "10+ times" (in past 12 months)	Stolen a motor vehicle (e.g., car, motorbike)	In 2002: 1 = 3+ different acts, 0 = < 3 acts In 2010: 1 = 1+ different acts, 0 = 0 acts
Binge drinking	19–20 & 27–28 years	ATP devised	1 item at 19–20, 2 items at 27–28 years: number of days in the past month	In the past month, on how many days did you have 7 or more drinks (if male) or 5 or more drinks (if female)?	1 = high binge drinking (highest quartile), 0 = remainder
Antisocial peers	19–20 & 27–28 years	Christchurch Health and Development Study (21-year interview)	5 items at 19–20, 6 items at 27–28; 3-point scale ranging from 0 = "none" to 3 = "most"	How many of your close friends would you say: Have been in trouble with the law?	1 = high antisocial peer affiliations (highest quartile) vs 0 = remainder

continued on next page

Table 2: Summary of other measures used in the analyses

Dimension	Age	Measurement instrument	Number of items, response categories	Example item	Use in current analysis
Relationship with parent(s)	19–20 & 27–28 years	At 19–20: short form of Macdonald's (1988) Social Support Scale At 27–28: Pierce, Sarason, & Sarason's (1991) Quality of Relationships Inventory	At 19–20: 17 items, 5-point scale ranging from 1 = "strongly agree" to 5 = "strongly disagree" [a] At 27–28: 9 items, 5-point scale ranging from 1 = "always" to 5 = "never" [a]	About relationships with parent(s): I feel very close to them	1 = low relationship quality (lowest quartile), 0 = remainder
Relationship status	27–28 years	ATP devised	Single item; 4 response categories ranging from 1 = "not seeing/dating anyone" to 4 = "in a committed relationship (same sex)"	Are you currently …?	1 = in a committed relationship, 0 = not in a committed relationship
Parent of a child	27–28 years	ATP devised	Single item; 4 response categories ranging from 1 = "no" to 4 "yes, I am a parent (natural or step-parent)"	Are you or your partner pregnant and/or the natural (biological) or step-parent of a child?	1 = parent, 0 = not a parent
Validation variables					
Crash involvement	19–20 & 27–28 years	ATP devised	Single item, number of crashes/accidents	Since starting to drive (or ride a motorbike), have you crashed or had an accident when you were the driver? If yes—number of crashes/accidents	Continuous variable
Detection for speeding	19–20 & 27–28 years	ATP devised	Single item, number of times caught speeding	How many times have you been caught speeding?	Continuous variable
Driving exposure	19–20 & 27–28 years	ATP devised	4 items; number of hours	In a normal week, how many hours would you spend driving a car (or riding a motorbike) in each time period below (think about the last week as a guide): Monday to Friday, daylight hours?	Continuous variable

Note: [a] Scale was reverse-coded so that a high score was indicative of high parent–child relationship quality.

Stability of risky driving between 19–20 and 27–28 years

To assist with the identification of factors that may differentiate between different subgroups of young drivers, participants were grouped on the basis of their pattern of risky driving behaviour from ages 19–20 to 27–28 years.

Risky driving was assessed by the frequency with which young drivers reported having engaged in seven risky driving acts during their last ten driving trips: driven up to 10 km/h over the limit, driven between 11 and 25 km/h over the limit, driven more than 25 km/h over the limit, did not wear seat belt/helmet for part of the trip, did not wear seat belt/helmet at all, driven when very tired, and driven when probably affected by alcohol. While a broader pool of items was available to measure risky driving (as displayed in Table 1 on page 4), these items were selected because they were included at all time points under investigation.

Participants' responses to the seven risky driving items were summed at each time point to make a total risky driving score, which had a possible range of 0 to 70. Only those with responses to all seven items at 19–20 and 27–28 years were included in the analysis. However, participants with missing data for one or more risky driving items at 23–24 years were retained, as observing trends in risky driving behaviour from ages 19–20 to 27–28 was the main objective. This left 735 respondents available for analysis; 94 (13%) of whom had missing data at 23–24 years.

The mean risky driving scores for the sample at each age are shown in Table 3. Paired *t*-tests show that mean levels of risky driving were similar at 19–20 and 23–24 years, but significantly lower at 27–28 years than at earlier time points.[5]

Table 3: Mean, standard deviation, minimum and maximum risky driving scores, by age

	N	Mean (*SD*) score	Minimum score	Maximum score
19–20 years	734	7.84 (7.42)	0	65
23–24 years	642	7.62 (7.44)	0	57
27–28 years	734	6.22 (6.88)	0	60

At each time point, participants were then divided into four groups on the basis of their risky driving score. Each group contained approximately 25% of the sample (i.e., the lowest 25%, second lowest 25%, etc.). The score ranges for each of these groups (known as "quartiles") at each age are shown in Table 4.

Table 4: Risky driving score ranges for the four quartiles, by age

Quartile	Risky driving score ranges		
	19–20 years	23–24 years	27–28 years
1st (lowest 25%)	0–2	0–2	0–2
2nd	3–6	3–5	3–4
3rd	7–11	6–10	5–8
4th (highest 25%)	12–65	11–57	9–64

Finally, respondents were allocated to one of seven groups, based on the stability of their quartile classification across the three time points (i.e., stable, increasing, decreasing). A summary of these groups is provided in Table 5 (on page 8). The total number of participants captured across these seven groups was 566. The remaining 169 participants (23%) displayed patterns that did not fit these groups (e.g., low to high to low, or moderate to high to moderate). As the aim of the report was to differentiate between those who displayed stable, increasing and decreasing patterns of risky driving, these participants were excluded from further analyses.

[5] Risky driving scores at 19–20 vs 27–28 years: $t(734) = 5.76$, $p < .001$; risky driving scores at 23–24 years vs 27–28 years: $t(643) = 5.88$, $p < .001$.

Table 5: Risky driving groups, sample sizes and descriptions

Group	Description	*N*	Mean risky driving score (*SD*)	
			19–20 years	27–28 years
Stable				
Stable high	Highest quartile at all time points	63	19.63 (6.68)	19.30 (8.96)
Stable moderate	2nd or 3rd quartile at all time points	105	6.40 (4.93)	4.93 (1.62)
Stable low	Lowest quartile at all time points	68	0.85 (0.83)	0.69 (0.80)
Increasing				
Low to high/moderate	Lowest quartile at 19–20 Highest or 3rd quartile at 27–28	48	1.21 (0.85)	10.54 (5.96)
Moderate to high	2nd or 3rd quartile at 19–20 Highest quartile at 27–28	61	7.21 (2.86)	14.08 (5.61)
Decreasing				
High to low/moderate	Highest quartile at 19–20 1st, 2nd or 3rd quartile at 27–28	95	17.14 (5.20)	3.78 (2.66)
Moderate to low	2nd or 3rd quartile at 19–20 Lowest quartile at 27–28	126	5.53 (2.40)	1.18 (0.78)

As can be observed in Table 5, the risky driving groups significantly differed in their levels of risky driving behaviour at 19–20 and 27–28 years.[6] The mean risky driving score for the stable high group was noticeably higher than for the other groups (particularly the stable low group) at both 19–20 and 27–28 years. There were also large changes in the mean risky driving scores of the "increasing" and "decreasing" groups between these two ages.

The groups also significantly differed on two indices commonly associated with risky driving behaviour—rates of crash involvement and detection for speeding (see Table 6),[7] with the stable high group scoring highest on these indices, and the stable low group scoring lowest. As the amount of driving undertaken by an individual is associated with his/her chance of becoming involved in a crash (Diamantoupoulou, Skalova, Dyte, & Cameron, 1996; Harrison & Christie, 2003) or being detected by police for speeding (Diamantoupoulou, Cameron, Dyte, & Cameron, 1997), the effects of driving exposure (the average number of hours spent driving each week) were controlled when comparing groups on these outcomes.

Table 6: Mean number of times caught speeding and times crashed while driving, by risky driving group (at 27–28 years)

Group	Times caught speeding	Times crashed while driving
	Mean (SE)	
Stable		
Stable high	4.44 (0.27)	1.93 (0.16)
Stable moderate	1.77 (0.21)	1.45 (0.13)
Stable low	0.70 (0.26)	1.04 (0.16)
Increasing		
Low to high/moderate	1.54 (0.31)	1.36 (0.19)
Moderate to high	2.77 (0.28)	1.42 (0.17)
Decreasing		
High to low/moderate	2.57 (0.22)	1.33 (0.13)
Moderate to low	1.41 (0.19)	1.19 (0.12)

[6] Mean risky driving scores—19–20 years: $F(6,565) = 295.09$, $p < .001$; 27–28 years: $F(6,565) = 208.09$, $p < .001$.

[7] Number of times caught speeding: $F(6,552) = 21.91$, $p < .001$; number of crashes while driving: $F(6,550) = 3.18$, $p < .01$.

The distinct differences between the groups in their levels of risky driving behaviour, rates of crash involvement and detection for speeding support the classification of the groups, and consequently, their use in further analyses.

Comparison of risky driving groups at 19–20 and 27–28 years

A major aim of this report was to compare the characteristics of young people who exhibited different across-time patterns of risky driving behaviour to determine whether they displayed distinct profiles. To achieve this aim, three separate multinomial logistic regressions were performed: (a) using the predictor variables measured at 19–20 years; (b) using the predictor variables measured at 27–28 years; and (c) using gender to examine if this alone was a significant predictor of risky driving group membership. Examining each age separately allowed changes, both across the predictors and in risky driving behaviour, to be clearly captured over time, and maximised the number of participants included in the analyses, which is important to maintain statistical power.

We had hoped to repeat the first two regression analyses separately for males and females to determine whether different characteristics (i.e., the predictor variables measured at 19–20 and 27–28 years) were associated with particular driving patterns for males and females. However, the small number of male or female participants in some groups prevented us from performing these analyses. Hence, in order to test the relationship between gender and risky driving group membership, the third multinomial logistic regression, including gender and risky driving group (described above), was performed.

For each analysis, marginal effects were calculated for each risky driving group across all of the predictor variables. This statistic, which can be expressed as a percentage, reports the likelihood that a member of a particular group (e.g., the stable high group) will display a particular characteristic (e.g., high binge drinking) in comparison to the remainder of the sample (i.e., the other six groups combined). Only statistically significant marginal effects will be reported.

Table 7 (on page 10) displays the marginal effects (as percentages) for the seven risky driving groups across the age 19–20 and 27–28 predictor variables. The percentage of respondents from each group who reported each predictor variable is shown in Appendix Table A1 (on page 17).

The stable groups

Being male was estimated to increase the probability of being in the stable high group by 14%.

Comparatively higher levels of antisocial behaviour were observed at both 19–20 and 27–28 years of age for this group, and high levels of binge drinking were also found at 27–28 years. More specifically, young people who were highly antisocial at 19–20 years and 27–28 years, and those who reported high levels of binge drinking at 27–28 years were 13% more likely to exhibit a stable high risky driving pattern.

Conversely, the stable low group reported lower levels of antisocial behaviour at both time points. At 19–20 years, young people who were highly antisocial were 9% less likely to be in the stable low group. At age 27–28, antisocial behaviour was again a negative predictor for this group, with antisocial individuals being 8% less likely to be classified as exhibiting a stable low risky driving pattern. Furthermore, in contrast to the stable high group, males were 11% less likely to be in the stable low group.

For the stable moderate group, no significant effects were present at 19–20 years across the predictor variables, but at 27–28 years, this group was associated with a lower likelihood of excessive binge drinking and were also less likely to be parents. That is, at 27–28 years, those who reported high levels of binge drinking were 10% less likely to be in the stable moderate group, and respondents with a child or children were also 9% less likely to be in this group.

Table 7: Marginal effects (%) for the risky driving groups across the age 19–20 and 27–28 predictor variables

Variable	Stable			Decreasing		Increasing	
	Stable high	Stable moderate	Stable low	High to low/ moderate	Moderate to low	Low to high/ moderate	Moderate to high
Gender (male)	14.1 ***	–1.4	–10.8 ***	0.2	–5.4	1.8	1.5
19–20 years							
Antisocial behaviours: 3+	12.9*	–4.1	–9.4 ***	16.1 *	–4.1	–8.3 ***	–3.1
High antisocial peers	5.5	0.4	–0.6	–1.6	–1.6	4.2	–6.3
High binge drinking	4.4	–9.5	–0.7	6.0	–6.8	2.9	3.7
Low civic-mindedness	2.9	–4.8	0.1	–1.8	–0.5	2.7	1.6
Low persistence	0.6	–10.6	–1.0	2.3	10.7	0.3	–2.4
High reactivity	0.4	–1.7	–0.4	1.6	6.9	–3.3	–4.3
Low social skills	0.8	3.1	–0.3	–0.2	–6.0	0.9	1.8
Low parent–child relationship quality	4.3	4.6	0.2	–4.1	–14.3	2.7	6.7
27–28 years							
Low education	3.0	–4.6	–2.1	–0.4	–6.3	2.6	7.8
Antisocial behaviours: 1+	12.9 **	3.1	–7.6 *	–0.3	–8.6 *	1.1	–0.5
High antisocial peers	2.1	4.4	–4.6	6.7	–0.8	1.6	–0.4
High binge drinking	13.0 **	–10.0 **	–5.9	–0.5	–2.8	1.1	5.1
In committed relationship	0.9	3.3	–5.7	3.8	4.3	–3.3	–3.4
Parent of a child	4.9	–9.0 *	3.8	2.7	2.4	0.9	–5.8
Low civic-mindedness	0.5	5.6	–1.7	–0.6	–3.0	–3.9	3.1
Low social skills	3.4	5.8	–1.9	0.2	–5.6	11.0 **	–1.3
Low parent–child relationship quality	2.6	2.7	0.6	–5.6	–6.1	1.2	4.5

Note: *** $p < .001$, ** $p < .01$, * $p < .05$.

The increasing groups

For the low to high/moderate group, comparatively low levels of antisocial behaviour were observed at 19–20 years of age, but this effect had disappeared at 27–28 years, in accordance with a relative increase in risky driving behaviour. More specifically, at 19–20, respondents who reported three or more antisocial behaviours were 8% less likely to be in the low to high/moderate group, but at 27–28 years, antisocial behaviour was not a significant predictor for this group. Interestingly, low social skills were associated with this group at 27–28 years, with respondents reporting a low level of social skills being 11% more likely to be in this group.

For the other group with an increasing pattern (moderate to high), no significant marginal effects at either time point were detected.

The decreasing groups

Highly antisocial individuals were 16% more likely to be in the high to low/moderate group at 19–20 years. The high rates of antisocial behaviour for the high to low/moderate group were no longer present at 27–28 years, however, which is likely to be associated with the decreasing level of risky driving behaviour reported in this group from 19–20 to 27–28 years.

Conversely, while there was no significant association with antisocial behaviour in the moderate to low group at 19–20 years, those who reported one or more antisocial behaviour(s) at 27–28 years were 9% less likely to be part of this group at this time point. Therefore, once again, comparatively lower levels of antisocial behaviour were associated with being in a group demonstrating a decreased level of risky driving behaviour.

Discussion

This report examined the stability of risky driving behaviour from the late teens to the late twenties among a community sample of young Australian drivers. Two issues were investigated: the stability of risky driving tendencies among individuals between the ages of 19–20 and 27–28 years, and the factors that differentiated groups exhibiting different across-time patterns of risky driving behaviour (i.e., stable, increasing or decreasing).

Stability of risky driving from 19–20 to 27–28 years

Consistent with past research (Bingham et al., 2008; Jessor et al., 1997), a significant decrease in risky driving was observed among study members over the transition from late adolescence (19–20 years) to adulthood (27–28 years). While rates of risky driving remained similar across the sample between 19–20 and 23–24 years, by the late twenties, levels of risky driving were significantly lower. The timing of these changes is in accordance with developmental theories that suggest that engagement in risky driving decreases as the prefrontal cortex matures and young people adopt adult roles (e.g., marry, have children), changes that typically do not occur until the mid-twenties or later (de Vaus, 2004; Sowell et al., 1999).

However, while there was a general trend for levels of risky driving to decrease across the sample between 19–20 and 27–28 years, considerable variability was found in the risky driving patterns of individuals over this period. Close to a third (32%) of study members exhibited the same level of risky driving at 27–28 years that they had at 19–20 years (i.e., low, moderate or high), a similar proportion (30%) showed a decrease in risky driving over this period, 15% increased their involvement in risky driving, while 23% displayed across-time patterns that did not fit these groups (e.g., undulating levels of risky driving, such as low to high to low, when levels of risky driving at 23–24 years were also considered).

These findings add support for the widely held view that young drivers are not a homogenous group (Ulleberg, 2001), and suggest that risky driving is a continuing concern for a sizeable minority in their late twenties. As the driving patterns of a significant number changed for better or worse over the transition from adolescence to early adulthood (i.e., the increasing and decreasing groups), these findings suggest a capacity for change among some young drivers. Hence, intervention initiatives targeting risky driving during this period may have the potential to reduce engagement in this behaviour among some young people. However, given the growing evidence that many problem behaviours that emerge in adolescence and early adulthood have their origins in childhood (Spence, 2003; Vassallo et al., 2002; Vassallo et al., 2007), it is likely that interventions at an earlier age are also likely to be beneficial, particularly for those showing more entrenched patterns of risky driving (i.e., the stable high group). Further research is required, to confirm the efficacy of different intervention approaches with the varying subgroups of drivers.

Factors differentiating stable, increasing and decreasing groups

Engagement in antisocial behaviour appeared to be strongly related to persistence and change in risky driving behaviour between the ages of 19–20 and 27–28 years. For instance, study members who consistently exhibited high levels of risky driving behaviour (the stable high group) were more likely to engage in antisocial behaviour at both 19–20 and 27–28 years than those in other groups, while stable low risky drivers were less likely to do so. Furthermore, corresponding changes in antisocial behaviour were noted among three of the four groups who exhibited increases or decreases in levels of risky driving behaviour over the study period (i.e., the low to high/moderate, the high to low/moderate, and the moderate to low groups). These findings add to the growing body of research that suggests that risky driving and antisocial behaviour are interrelated and may form part of a broader underlying tendency to engage in problem behaviour (Jessor et al., 1997; Shope & Bingham, 2002; Vassallo et al., 2008).

The observation that stable high risky drivers were significantly more likely to engage in frequent binge drinking (at 27–28 years), adds further support for this hypothesis. There is increasing evidence that young people who take risks on the road more often engage in alcohol use and misuse (Beirness & Simpson, 1988; Shope & Bingham, 2002; Vassallo et al., 2008). The stable moderate and stable low groups reported markedly lower rates of high binge drinking than the stable high group (although only the stable high and stable moderate groups significantly differed), further reinforcing the view that risky driving and alcohol use co-occur.

Gender was another important predictor of risky driving stability. Males were significantly more likely than females to be stable high risky drivers (comprising 71% of this group) and significantly less likely to be stable low risky drivers (accounting for 19% of this group). These findings are consistent with those of Begg and colleagues (Begg & Langley, 2004; Gulliver & Begg, 2007), who observed that "persistent risky drivers" were more commonly male, and a wealth of research that has shown that males are more likely than females to engage in risky driving behaviour (Fergusson, Swain-Campbell, & Horwood, 2003; Rhodes & Pivik, 2011).

Low social skills, on the other hand, were associated with an increasing pattern of risky driving behaviour for one group. Almost half of the low to high/moderate group scored within the bottom 25% of the sample on social skills at 27–28 years. Furthermore, a sizeable proportion of this group (33%) exhibited low social skills at 19–20 years, suggesting that this was an ongoing issue for many of these drivers. While not significant, low social skills were also quite prevalent in the stable high group at both time points (i.e., 40% at 19–20 and 36% at 27–28 years). Considerable research exists to suggest that social skill deficits play a central role in many behavioural problems (Spence, 2003). Consistent with this, previous ATP research has found associations between low social skills and a range of problem behaviours, including antisocial behaviour (Vassallo et al., 2002), substance use (Williams, Sanson, Toumbourou, & Smart, 2000), and risky driving (Vassallo et al., 2007). The current findings cannot explain the mechanisms by which lower social skills may facilitate an increase in risky driving behaviour. However, it can be hypothesised that low responsibility and self-control (which may reflect more general self-regulation problems) may manifest in a reckless approach to driving, while difficulties relating to others may result in a tendency to "act out" and engage in problem behaviours in a bid to gain attention or approval from others.

Contrary to expectations, level of maturity (as reflected by being in a committed relationship and/or being the parent of a child) did not appear to be strongly related to stability or change in risky driving behaviour. The only group that significantly differed on this aspect was the stable moderate group, who were less likely than their peers to be parents at 27–28 years. Only 14% of this group were parents by their late twenties, whereas approximately a fifth of most other groups were parents by this age. Interestingly, the moderate to high group reported even lower rates of parenthood (10%) than the stable high group at 27–28 years; however, this difference did not reach statistical significance, possibly due to the small size of the moderate to high group (n = 61). It is possible that increasing maturity may have an indirect influence on risky driving (possibly via its effect on antisocial behaviour or alcohol use), thus explaining why a clear association was not found between maturity and risky driving in this study. Further research is needed to better understand the nature of this relationship.

Similarly, many other characteristics that have been shown to be associated with risky driving behaviour (i.e., temperament, antisocial peer affiliations, civic-mindedness, parent–child relationship quality, education) did not differentiate between young people who exhibited different across-time patterns of risky driving in this study. While this finding may reflect the actual situation, it is also possible that small groups sizes may have contributed to this result, by limiting the statistical power available to detect significant differences. Indeed, an examination of the rates of the predictor variables across the different groups (see Appendix Table A1 on page 17) supports this argument, with trends generally in the expected directions (e.g., 29% of stable high risky drivers had high antisocial peer affiliations at 19–20 years compared with only 8.8% of stable low risky drivers). Hence, replication of the current findings with larger samples would be desirable.

Furthermore, given the strong association between gender and risky driving behaviour, we had hoped to examine the profiles of the seven risky driving groups separately for males and females. However, as noted previously, the small numbers of males or females in some of these groups

precluded this analysis. Hence, further research addressing this issue would also appear to be beneficial.

Longitudinal studies such as this one, which observe patterns of risky driving over time, provide a better opportunity to understand the development of risky driving and the factors that may underpin persistence and change in this behaviour, than studies that rely on data from a single point in time. Hence, it is recommended that future studies in this area adopt a similar longitudinal approach.

Conclusion

In conclusion, a significant decline in levels of risky driving was observed among this sample of young Australians over the transition from adolescence (19–20) to adulthood (27–28 years). Nevertheless, despite this overall decrease, levels of risky driving remained high or increased for a sizeable number of young drivers, highlighting the need for continuing road safety initiatives targeting drivers in their late twenties.

A number of factors distinguished young people who exhibited different across-time patterns of risky driving. Engagement in antisocial behaviour appeared to be strongly linked to stability and change in risky driving, adding support to the view that risky driving may be one part of a broader risk-taking lifestyle for some young people. Low social skills, on the other hand, were associated with an increasing propensity for risky driving among some young drivers (i.e., the low to high/moderate group). Binge drinking, gender and parental status also differentiated between drivers who exhibited different across-time patterns of risky driving behaviour.

Taken together, these findings add to the growing body of research that suggests that risky drivers are not identical. Hence, when considering how best to target risky drivers, it would appear important to distinguish between different subgroups of drivers (i.e., stable, increasing and decreasing), as the factors that underlie their behaviour may differ.

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Appendix

Table A1: Percentage of each group who displayed predictor variable (at 19–20 and 27–28 years)

Variable	Stable			Decreasing		Increasing	
	Stable high (*n* = 63)	Stable moderate (*n* = 105)	Stable low (*n* = 68)	High to low/ moderate (*n* = 95)	Moderate to low (*n* = 126)	Low to high/ moderate (*n* = 48)	Moderate to high (*n* = 61)
Gender (male)	71.4 *	39.1	19.1 *	41.1	34.9	45.8	44.3
19–20 years							
Antisocial behaviours: 3+	34.9 *	12.5	1.5 *	25.0 *	13.0	4.2 *	8.3
High antisocial peers	28.6	17.4	8.8	27.7	15.9	23.4	15.3
High binge drinking	25.4	11.3	8.5	27.3	14.4	27.0	23.5
Low civic-mindedness	41.3	28.2	33.9	29.7	28.7	42.6	38.6
Low persistence	41.3	26.7	14.7	26.8	35.2	43.8	31.2
High reactivity	28.6	21.0	14.7	25.3	26.4	18.8	23.0
Low social skills	40.3	27.6	17.9	27.4	18.4	33.3	26.2
Low parent–child relationship quality	38.9	25.3	29.2	21.8	13.2	37.8	28.8
27–28 years							
Low education	26.2	15.8	16.7	21.1	16.0	23.4	28.3
Antisocial behaviours: 1+	46.8 *	25.0	10.5 *	23.1	16.4 *	28.3	22.0
High antisocial peers	38.1	18.1	10.5	23.9	19.1	29.8	20.0
High binge drinking	41.3 *	15.2 *	11.8	22.1	19.1	25.0	32.8
In committed relationship	71.4	78.1	68.7	80.7	80.2	64.6	61.7
Parent of a child	20.6	14.3 *	20.6	23.2	23.0	20.8	9.8
Low civic-mindedness	35.5	38.1	30.3	31.9	28.6	29.2	39.0
Low social skills	35.5	19.1	19.1	26.6	18.4	47.9 *	26.7
Low parent–child relationship quality	33.9	28.9	26.2	22.6	19.2	37.0	33.9

Note: * Indicates a significant marginal effect (as indicated in Table 7 on page 10).